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EPISODE 190 TRANSCRIPT

Jamie

Welcome to Two Bees in a Podcast brought to you by the Honey Bee Research Extension Laboratory at the University of Florida's Institute of Food and Agricultural Sciences. It is our goal to advance the understanding of honey bees and beekeeping, grow the beekeeping community and improve the health of honey bees everywhere. In this podcast, you'll hear research updates, beekeeping management practices discussed and advice on beekeeping from our resident experts, beekeepers, scientists and other program guests. Join us for today's program. And thank you for listening to Two Bees in a Podcast.

Amy

Hello everybody, and welcome to this segment of Two Bees in a Podcast. Jamie Ellis could not make it on this episode today to host, so I am welcoming Dr. Cameron Jack to the podcast today as my co-host. Thanks for joining, Cameron.

Dr. Cameron Jack

Hello, hello. I'm glad to be here. I can't believe you invited me back again.

Amy

I know we always love to have you. We'll have you on more often, I promise.

Dr. Cameron Jack

Yeah, okay, okay, sure. That's what everybody says.

Amy

Well, today Cameron and I are very excited to be introducing Dr. Ferhat Ozturk, who is an Associate Professor of Instruction at the University of Texas San Antonio in the Department of Biology, Health, and Environmental Sciences, and also the Director of Honey Pathway, which is a USDA Next Gen. program. Dr. Ozturk, thank you so much for joining us today.

Dr. Ferhat Ozturk

Thank you for having me, it's my pleasure.

Amy

It's kind of fun having the three of us, me, you and Cameron on this podcast because I think the last time the three of us, well, I guess the first time we all met and the last time we were together was in Santiago in Chile for Apimondia. So, it's almost like a little reunion that we're having today on the episode. So, I'm excited. I'm excited for the three of us to be together.

Dr. Ferhat Ozturk

Yeah, me too. I mean, let's go to the Chilean restaurant and just relive the things.

Amy

Absolutely. So, today we brought you on to talk about a couple of things. You are an Associate Professor of Instruction. You're at the University of Texas, and one thing that we brought you on to talk to you today about was a class that you teach for undergraduate students at the University of Texas in San Antonio. Specifically, it's called a CURE class, which we'll get into what that means in just a little bit. And in your CURE class, you teach about the medicinal properties of honey. So, with this episode, we're really focusing on the CURE class, what that means, what that entails for you, what that means for students, and then also just the medicinal side of honey and what that means because I think that there's a lot of research that can be done. But before we get to that, why don't you go ahead and introduce yourself to our listeners and tell us how you got into the honey bee world?

Dr. Ferhat Ozturk

Sure. So, I am originally from Turkey, my home country is, and I finished my bachelor's in Istanbul, Turkey at [inaudible] University in Biology. I was approved for the PhD program at University of Nevada, Reno and I completed my PhD in Cell and Molecular Biology. And then I was admitted to University of Nebraska Medical Center in Omaha in Lincoln, Nebraska, and I did my postdoctoral research in cell signaling and bioinformatics. And then I turned to my home country for molecular biology and genetics teaching, and also department chair for 3 1/2 years. And meanwhile, I had the chance to get introduced into the honey world. There was a Honey Research Center at my University in [inaudible] University in Samsun, Turkey. And then I have been assigned as the Director of the Honey Research Center. So that was the time I fell in love with honey, and then I was involved very deeply in the medicinal properties of honey. As you may know, in most of the countries, honey has been used as a medicine for thousands of years and there were a lot of research that was going on in Turkey about which honey has more medicinal potential. And I was able to get introduced with great scientists in my home country.

And then it kind of enlightened me to get more involved in honey research based on my molecular biology, cell biology, bioinformatics background. And then I came to the US, to Alma College in Michigan, and I taught a couple of different classes, but the most interesting one was Beekeeping and Medicinal Honey for a summer course. And I had a chance to meet with local beekeepers in Michigan and also did some analysis of the Michigan honey, about 150 samples we collected. And then I came to San Antonio, and I taught in a high school as a biomedical science teacher at School of Science and Technology. Eventually, I was transitioned to University of Texas San Antonio back just at the end of the COVID pandemic, and I started teaching Biosciences. Also, I was offered to teach Medicinal Properties of Honey as a CURE class. So, I

was the CURE lab coordinator for five different courses, but the most interesting and most exciting one was I will be able to teach my love for medicinal honey as a CURE course for one full year for the students who are interested in research and publications, hopefully, and to work more about medicinal honey.

Dr. Cameron Jack

Well, Ferhat, I'm really glad that I'm able to sit in and fill in for Jamie today because you and I, we've known each other for a couple of years now. I think we first met maybe at ABF when it was in Jacksonville a couple years ago, but then we both hit it off really quickly because we both have a high teaching load and we both teach CURE classes. So, we've been saying that word a lot, like we've been saying cure classes a lot. Could you tell us about a little bit like, first of all, what is a CURE class? And then tell us a little bit about your position now at UTSA and specifically, what courses do you teach to undergrads that you're offering right now?

Dr. Ferhat Ozturk

Sure. I mean, actually, as you may expect, CURE is an acronym. So, it is not to cure anybody or any disease, but CURE is the acronym for Course-Based Undergraduate Research Experience. And these CURE courses are becoming more and more prevalent in the US institutions because we really would like to involve more undergraduates in the research field, even if they don't go for PhD programs or medical school. We still want them to have some kind of research experience at the undergraduate level. As you know, as a faculty member, I mean, it's not very easy for us to recruit 10 or 15 or 20 students as undergraduate assistants. But the CURE program allows me to convert my research passion into a teaching class. So, again, this is a great opportunity for the faculty who are interested in educating the undergraduates about their research and also doing the research with them.

So, it makes it a little bit easier for them to comprehend. Again, the best thing is instead of having two or three undergraduates per year, now I can have 20 undergraduates per year. So, in my class, in the H-honey CURE class, every year I have 20 undergraduate students who are interested in learning about research, how to be a scientist in a year of program, how to access the reliable articles in the scientific world, and then how to read them and as well as create a library out of them. Also, they learn how to write a grant proposal for the NSFGFRP program. So, they need to write, as part of their class, a grant proposal. And then they learn how to do peer mentoring and also, they design a research experiment, which is feasible within the boundaries of the UTSA. So those students design the experiment, after they get the approval, they execute the experiments and then they collect the data, analyze the data, and also disseminate this data as part of their CURE symposium at the end of the year. So, all the students present their findings in a poster, and then also they have the opportunities to join for national conferences in different parts of the country.

So, this provides them with an opportunity to live the life of a scientist in a year. And also, we can come up with challenges -- like not everything flows very fluently because this is not a cookbook lab. So basically, the students are learning what happens if you need to troubleshoot. What if one experiment doesn't work or what if one of the chemicals is expired? What are you going to do in those cases? So, we are coming across all different scenarios that a scientist would live, or a PhD student would live throughout their academic life. So, again, most of my students are also inclined towards writing a research publication. So last year all of my students turned their research into a manuscript and some of them submitted them, and one of them actually got approval for a book chapter publication. So, it will be a part of Medicinal Benefits of Honey and Propolis and the subject is Use of Honey for Burn Wounds in Animal and Chemical Use. So that's our first publication as the Honey Pathway. But we are making more. We have about 10 publications in the pipeline. So, when I have a little bit more time, I'm going to work on them with my students and hopefully we'll be able to get published.

So, this is a great opportunity for the students to get a publication during their undergraduate years. You and I, we both, I mean, we all walk the pathway of PhD and most of us don't have publications until the last year of PhD or like graduating with it. So, now the CURE program provides this opportunity to the undergraduates. I believe this feels very, very helpful for the students who are looking for professional degrees in the future.

Amy

So, Ferhat, I think you did a great job describing the CURE course. I personally didn't know what a CURE course was until I started working with Cameron here. And I mentioned this before we started recording today, but we've brought on bee researchers, we've brought on a lot of faculty members with different split appointments in teaching, research and extension. We've really highlighted a lot of research. We've really highlighted a lot of extension programs out there. We've not so much in this podcast highlighted instruction. And so that's why I'm really happy that you're here. I'm glad that you were able to tell us what a CURE class was and some of the courses that you have. I think it's important to kind of highlight that, us, in academia, we are really in the business of knowledge, right? And that is what we do. That is part of that instruction piece. That's part of teaching is just the business of knowledge and being one step closer to finding the answer, putting together scientific research, and also a huge part of that is supporting students, really supporting them to highlight their degrees and teach them how to conduct research, teach them how to think critically, to help them and assist them with what they're going to do moving forward. So, I'm really excited to continue this conversation about instruction.

So, I wanted to next kind of talk about your CURE course. I know you have multiple CURE courses that you do. That's great. The one that we brought you on to talk about today that we're really highlighting is the course: Medicinal Properties of Honey. So why don't you just start from the beginning? You've kind of told us a little bit about the history, but where did this idea come

from? What should the students expect? Or tell us about what you do with the students during this course.

Dr. Ferhat Ozturk

Yes, sure. Just need to clarify that I'm teaching only one CURE class right now. I was a CURE lab coordinator, but right now, because after the grant the Honey Pathway was established so I focused on only the honey class. In this case, what I'm teaching in the medicinal properties of honey is, so we are collecting the honey samples from local beekeepers, mostly in Texas. I, or, sometimes, my students, go to the beekeeping association meetings and we ask the beekeepers to donate their honey samples, about 8 oz. So, we bring them back to the lab and we look for the physical/chemical characteristics, antimicrobial properties and antioxidant properties. So, these are the three main components to identify honey as a medical grade honey. So, because these are the components to become a bioactivity level, because the higher the bioactivity level, the higher the potential that honey to be considered as medicinal honey. As you know, there are more than 100 different types of honey available on the market. And then most of the time people name them based on the origin of the nectar.

So, we don't know. I mean, it's very hard to identify which honey has more medicinal potential. So, there are lots of traditional medicine applications of the honey for thousands of years. But to identify which honey has more medicinal potential will give us a better idea to bring the honey from the hive to the bedside. We can make translational research. And as you may already know, there are medicinal honeys available in the wound clinics or burn clinics in different parts of the world, especially in the US. Even the US Army is using wound agents made from honeys. But most of the honeys in the world are coming from in New Zealand. I mean, medical grade honey is mostly known as the Manuka honey because it is the understanding of the people. But what we would like to achieve is there are other local honeys which can, I don't say compete, but which can kind of be as high, as competent as the Manuka honeys in terms of biological activity. So, again, what we do in this class is we collect about 120 samples from local beekeepers every year in the summer. And then we register them with their addresses, phone number, nectar source, the bee strain, if they are treated or not. So we kind of have a survey for each beekeeper to fill out and then we start analyzing them for their easy parts, which is the kind of the color, pH, moisture and pollen content. By this way, we understand that like this is a real honey. It has the minimum characteristics to be identified as honey with these physical/chemical characteristics.

And then we go for antioxidant properties. So, basically, honey is a very rich antioxidant with phenolic acids and fluvalinates and tannins in them. So, we identify the antioxidant activity by using DPPH assay. In this DPPH assay, which is a free radical. So, we dilute the honeys, and then we add the DPPH, and we measure how much of this free radical is scavenged by the antioxidant inside the honey. So, from here we can understand how much these honey samples can suppress the oxidative stress in our cells because oxidative stress is the one that causes major

total diseases such as neurological disease, cardiovascular diseases, even cancer. They are all related to oxidative stress within our cells. So, that's why we need to consume antioxidants.

Honey is one of the richest sources of antioxidants because of the chemicals that come from the blossoms or from the nectar source and the bees are putting them into the honey for themselves and for us. So, when we consume those high antioxidant honeys, we are consuming high antioxidant chemicals or phytochemicals that come into our body and then they are working against some of the disease. So, this is an important part of medical potential.

And the other one is antimicrobial property because honey has been used as an antimicrobial agent for thousands of years. So, it is kind of killing most of the pathogenic bacteria that causes disease on us like Staph aureus, Klebsiella, Pseudomonas aeruginosa or E. coli. So, these are some of the major pathogens that cause disease in our bodies, on our skin, inside our guts. So, honey can help to kill these bacteria without harming our own good bacteria. So, honey can differentiate the probiotics from the pathogenic bacteria.

So, what we do is we use these honey samples, we make agar well diffusion assays. So, basically, we make a bacteria alone on an agar, and then we open up wells there and we add pure honey, like 100% honey into these wells. Then, the next day we check for how much of the bacteria were cleared from around the honey well. So, this is called zone of inhibition, and the higher of the zone of the inhibition, the higher antimicrobial potential. And then we combine all these data. There are some other experiments the students can do but in the second semester. But these are sufficient enough to identify if a honey sample has medicinal potential, and then if that honey can be classified as medical grade honey according to the International Honey Commission and other studies.

So basically, we are analyzing local honey samples for their physical/chemical characteristics, antimicrobial properties, and antioxidant properties to identify them as medical grade honeys in this Medicinal Properties of Honey class.

Amy

Ferhat, I'm really excited. I hope you know this. I'm putting this out there. You are my new medicinal honey person. I get so many questions that come in, and I don't know the answer to them. I haven't really been able to find someone to answer some of those medicinal questions, and so you're my new person. I hope you are okay with that.

Dr. Ferhat Ozturk

So happy to hear that.

Dr. Cameron Jack

I was going to say, Ferhat, I think probably most of the listeners are probably somewhat familiar with Manuka honey. That's the one medicinal honey that probably most everybody has heard of and is aware of. But even the concept, the idea of that, actually there's probably lots of nectar-producing plants and stuff that are producing some of these chemicals that would have benefits for medicinal purposes. And it could be in their backyard, right? It could be in the honey that they're producing. Just having somebody to know that and recognize that is huge. So, your research that you're doing with all these students is actually directly applicable to really just about any beekeeper that produces honey that's out there. So, kudos to you. I mean, what a cool area of focus. You and I have talked a lot about our CURE classes together. And one of the challenges is you've got 20 to 30 students in this class, probably a lot of them coming to you have never really had any real research experience other than, like what you said, like maybe a canned chemistry lab where they have to get a specific answer. This is something totally different. There are things that are going to go wrong. There are mistakes, like we don't know exactly what's going to happen because we're researching a novel question.

So how do you, as the professor of this class, help to incorporate the students into this knowing that they probably don't have a lot of background in this? What kind of tasks are they doing that are contributing to the overall body of the research?

Dr. Ferhat Ozturk

I mean, most of my students, my CURE students, I'm kind of focusing them to learn about microbiology and biochemistry techniques. So, basically, I start in the first week, we educate them about BSL-2 labs because we are using pathogenic bacteria, and BSL-2 is biosafety level 2, so those bacteria can cause disease in humans. So, they need to be careful about what they're handling with. So, as soon as they come to the lab, they get their lab coats and then they get their PPE, they clean up their desk because ours is a teaching lab with five standing desks. Four people can sit on each of them. The first thing again, they learn is about safety because lab safety is the key to having successful results, but as well as to avoid any damage to the students or to anybody else. And then I educate them about how to use a micro pipette because most of the time we assume that our students know how to use them because they got the bio lab or chemistry lab. But that's not true because I see that some of the students still don't differentiate the stop 1 and step 2 in micropipettes. And even some of them, when they're aspiring the liquids, they are bubbling it. I'm kind of educating about how to be accurate and precise in their measurements as they do liquid dispensing, like water dispensing and measuring them. And then again, we continue to educate them about how to use endnote because they need to start using the library and accessing Pub Med. They need to collect articles for their own grant proposal and for the research project. So, they learn how to collect them. The first couple of weeks are mostly about training. Before each class, I have devoted one day for lectures and guest speakers and another day is for experiments.

So, every Thursday I do my lecture about the class and then every Friday we have the experiments. This way, students are learning about how to do the experiment. But meanwhile, we have a lot of pre-labs. By the way, I forgot to mention that I have peer mentors and teaching assistants who are helping me, who are all of the graduates of the honey class. So, this is a great advantage for them and for me because they become peer mentors. They learn how to teach their peers. And it's very helpful for me because they help me to prepare the lab as well as to improve the class in terms of grading or experimental design, the procedures, and how we can improve them. So, they're helping me with preparations, all the stuck solutions and everything.

But again, we also have pre-labs, so the students read the procedure before they come and also a paper about it. And then they need to ask questions before they come to the lab. What are the questions that you would like to learn about this subject? So, it's kind of critical thinking. So, we tell them, okay, first of all, what is missing in the procedure? What do you think we should better explain in the procedure so that you guys better understand? And then also what do you want to learn from this experiment? So, I cover them in my lecture because they need to send these questions before ahead of time. This way, I'm clarifying their points before we even start the experiment.

And then, they have the post lab. So, they need to write their lab report, not for every experiment, but for most. And they need to write almost a full research paper. They have an abstract, objective, the introduction, materials and methods, results, discussion, conclusion, references. They have all these sections in their lab report. So basically, they are getting ready to write a research manuscript after each lab report, I would say. Again, I always tell them this is an improving class. Although it is my third year right now, we are still improving some of the experiments because there are new technologies coming in, but at the same time we read more papers. I mean, I didn't read all of the papers available in one subject. So, I try my best to keep improving.

And also, we are using micropipette readers or other new technologies as much as possible in the classroom so that the students are also aware of them. I keep telling them we may have mistakes and we need to troubleshoot. So, then we have a troubleshoot, for example, if one experiment doesn't work. The next week we get it in the class, and I ask them what went wrong? Why do you think this experiment did not work? And then I expect answers from the students and most of them have very good ideas. Most of the time they think out-of-the-box that I couldn't think of. Then we just improve the class. We just take notes for the next procedure or for next experiments. This way, we are troubleshooting all together. It's kind of a lab meeting, but it's a little bit large, like about 20 students. With the peer mentors, about 24. By this way, we are also going through how a scientist would troubleshoot when they have problems reaching the results. So, all these things are kind of accumulating in their own mindset. So, they learn how to critically think, and they also learn how to troubleshoot when there's a problem. They also make their team building skills because students work in teams. One of them is preparing the sample,

the other one is doing the experiment, the other one's taking the notes. So, it's kind of like working all together in a collaborative manner. And they also do what's called negotiation skills because sometimes one of them becomes a team leader and helps the others to run the project together. But sometimes one or two students do not have enough time for a meeting and then they just come up with alternative ideas. So, they meet in the classroom, they meet on Zoom, or they meet with their own time to make sure that they achieve their goal. So overall, the CURE class is one year of life of a scientist. So, they go through all these levels at different measures.

Amy

Yeah, it sounds like there are a lot of skills that are transferable that they learn in this course, not only how to conduct research, but how to lead a team, how to work in a team, how to work together, and how to problem solve and think critically. So, I think that those are all great things that a CURE class can offer to undergraduate students. So, the question that I have for you now is just moving to the results of the program. You've discussed publications that the students have written, and one has been accepted and other students are writing publications. What other results have come out of this program? I know that it's still fairly new. It's a couple of years, three years old. You've done it for three years now. But as far as the knowledge of students or maybe some of the feedback that the students have had or any results of the program on students, I'd love to hear from you.

Dr. Ferhat Ozturk

Maybe I would say the most compelling result is the one that we are working on an index to analyze any honey in the world for bioactivity level. As I said, I mean there are a couple of different medical grade honeys on the market, but most of them have their own measurements for their own honeys. What we are trying to develop is like every honey has some kind of medical potential as long as it is honey coming from the hive. Every honey has some type of bioactivity level, and with our students, we were able to develop a formula that are using these physical/chemical characteristics, anti-microbial properties, antioxidant properties. So, we are in the process of developing an index that can be used for any lab in the world so that they can analyze the honey for medical grade potential. We are working on that publication right now. The others are, like most of my students are interested in analyzing honey on different bacteria. For example, we work on Staph aureus in the class, but as an independent research or class research projects, students are working on some bacteria that causes dental disease or another bacterium that causes acne. Because honey has been used for treatment of acne and Cutibacterium acnes is the one that causes acne a lot. So, many students worked on how honey can prevent the growth of acne.

So, another group of students worked on how honey, because it's antioxidant, how honey can prevent the oxidation in the meat because meat or ground beef, when it is covered with honey, honey can prevent their oxidation. So, they will have a longer shelf life than compared to the

non-treated or like by themselves. So, honey can extend the life of the meat on the shelf. That's another project.

Another one is that we compared grocery store honeys with the local beekeeper honeys. Again, it's on the publication pipeline now, but our results are very compelling because we found that local beekeeper honeys are about four times more bioactive compared to the grocery store honeys, which means that people should find and consume local beekeeper honeys to have more bioactivity potential, to get more medicinal benefits from their honeys. Another research was about, again, we also observed the bee behaviors during the eclipse because San Antonio was a very lucky city. So, we were just in the center of the X when we have total eclipse and annual eclipse within six months of the frame. So, we were able to videotape and also get the acoustic data from the beehives from three different beehives. So now, again, it's also in the publication pipeline. So, we have observed and analyzed the behavioral activities of the bees during the eclipses.

Also, we are trying to reach out to the parents and health professionals. How much do they know about honey to be used as a medicine? So, we do surveys with them. And one of my students, she did her independent study on serving the medical professionals, the pharmacists, as well as the parents about how much they're aware using honey for allergies, the gastrointestinal disease, and also for skin treatment, for wound healing. So, we got some data from that one. Again, it's also another research that my students have completed. We also work on fungi, so how the honey can prevent the Candida albicans and also some other fungal dermatophytes, how honey can prevent their growth. We work on honey and biofilm. It's another research.

We are also working on creating some new hydrogels or hydrochloride sheets so we can create medical devices using honey to be used in the clinic directly because there are already honey gels or honey hydrochloric sheets or hydrogels. They are all available in the market. So, our biomedical engineering students are working on how we can use local honey for the same purpose. Instead of Manuka honey, can we use high medical grade honey as a medical device? So, this is some of the research. I mean, last year we had 16 different projects. So, it is not easy for me to follow all of them, but it's fun. I'm doing my best to contribute the most to my students. And that's why all semesters, I mean, I always think that okay, I'll have more time in summer, and the summer comes, more research projects. And then, I say, okay, I'll be more prepared for fall, and the fall comes, more research projects come. So, I'm trying to catch up with that, but again, with the help of my undergraduate assistants, my graduate assistants as well as peer mentors. So, we keep developing our course to reach more students.

And by the way, I'm starting a new class in the honors program in the Honors College. So, students who are eligible for Honors College will have a one semester course about medicinal honey. And it is kind of a shortened version of what I'm teaching right now.

Dr. Cameron Jack

Well, I think, Ferhat, all of us fall into this category where we're like kind of the eternal optimists where we think next semester is going to be way better, like I'll have like way more time, and it never works out that way. We just snowball all these projects together and the trick is getting them out on time. I was just going to say, I can't believe having 16 different projects going on. Just so that the listeners can really understand how this is the man of my time, I can speak to it a little bit just since I also have a CURE course, even though I try not to have too many projects going on at once because it becomes really difficult to juggle. But in a traditional style class, like you have to prepare, as a professor, you're preparing all the lectures, which of course takes lots of time, and then you go and deliver those lectures.

And this type of a class, not only are you preparing a bunch of lectures and providing instruction to students, but you're also providing a research lab. It's not just like, again, not a canned lab, like in a chemistry class where you are trying to get a specific answer. You're kind of letting them do this research that's novel. And there's lots of mistakes and issues and things that come up. I had a student once collapse in the field, stuff like that. It was just like, oh my gosh, I'm in the middle of a class and somebody collapses, and now I got to figure out what I'm going to do. There are all sorts of those types of issues. So, kudos to you.

I mean, it's just such a demanding class to teach, and that's why I think few professors really go for that. I wanted to also ask you and figure out what kind of students are taking these classes? Where are they coming from? Are they all from the Biological Sciences or Medical Sciences? Or are they coming from all over the university to take your class?

Dr. Ferhat Ozturk

Actually, my students are pretty diverse in terms of their backgrounds because this is mostly open. This is a bio course. It is BIO2073 or BIO3053. So, it is registered under biology, but luckily our biology department is the largest department at the university. We have about 8000 students, so it's a very big number, but about 2000 of them get Bio 1, which means that I have a chance to introduce my class. But on the other hand, we have microbiology students, we have neuroscience students, I have biomedical engineering students, and I even have computer science students who did a project about a VR program that you put the goggles, and you behave like a bee, and you can go and collect the nectar and pollen and so forth. So, that's a part of the project. I also have psychology students, public health students, to name a few, and medical humanities. So, all these students come from different educational backgrounds. They all contribute to the projects by themselves. So again, it is open to most of the biology related fields, but it's also open for non-biology related fields.

Right now, I'm moving towards Honors College, which means that this will be open for even business students or economic students. So hopefully, these diverse groups of students all come together on one subject, which is honey is a medicine.

So, now we need to identify how does this happen? I mean, what makes it? Honey is touching everybody's life. From 7 to 70 years old, we all consume honey. But what makes honey a unique product? What makes honey a medicinal product? So, it kind of makes them excited. And then they all provide their input from their own classes. Like, for example, one student, she was from NDRB, like neuroscience, and they prepared a grant proposal about how honey can be used for treatment of insomnia or how honey can be used for treatment of epilepsy or because it's antioxidant. So how we can bring this to the lab. And again, these grant proposals are hypothetical, so they don't have to do this. But the ideas that come from them are sometimes amazing. I mean, I say, wow, how did you connect this? Again, this various background of students is enriching the program and hopefully more students are aware of honey's potential to become a medicine in all the clinics. This really makes me excited too.

And another thing is most of my students, I ask them about what their aspirations after you finish, you graduate and a majority of them are pre-medical, pre-dental, pharmaceutical or Graduate School. So, these are very bright students, and they really would like to go to health professions. The thing that really excites me is that a big army, I mean, it's not a very big army, but at least six students are taking this class right now. So, all these students are aware that honey has been used as a medicine and has a lot of medicinal potential. So, once they become medical doctors or nurses or other professionals, they will be able to implement honey in their clinical practices.

Amy

Very cool. So, I'm going to go back really quick to something that you had mentioned when I had asked you about the results of the program. And something that you had mentioned was pulling together an index of honeys all over the world that you can take a look at and add to your database. And I think the first question that kind of comes to mind from me and probably some of our listeners is many of us have honey and is this a service that you can offer to beekeepers, especially beekeepers -- we have listeners from around the world. Is this something that you can offer beekeepers or can beekeepers help your research in that way of being able to send samples? And if so, how can they reach out to you directly?

Dr. Ferhat Ozturk

I mean, first of all, we are mostly focusing on Texan honeys the last three years because we really would like to see how it is changing and also, more Texan beekeepers are hearing about this. But on the other hand, we really would like to provide this service for other states or for other parts of the world.

So, for this reason, we are currently working on a company that we can regularly analyze the honeys because the CURE class is very limited in terms of resources as well as in terms of time because we only meet once a week. I mean twice a week, but once a week they do experiments,

and then with the students it's not very easy. They need to learn how to do analysis. So, right now, we are working on having one or two technicians who will be able to analyze the honeys on a day-to-day basis. We are working on establishing a lab that we can have samples throughout the year, and we can analyze them and provide them a certification provided by the university about its bioactivity level. So, right now we are working on it and hopefully by the end of this year, probably at the ABF, that's what our plan is, the American Beekeeping Federation conference. So, we will be able to advertise that you can send your honey samples for analysis in a one or two week turn out time and then we'll be able to analyze them for their bioactivity level or medical grade potential. But it is still in the progress of finding the lab and establishing the company.

Amy

Very cool. So, we are recording this episode at the end of October. It's almost November of 2024. So, when we're talking about ABF, that's the American Beekeeping Federation Conference in Reno, NV in 2025. So, that'll help our listeners keep us accountable for what we say that we're going to offer to them. So be sure to try to find one of us to see what the update is on that as well. Dr. Ferhat, we are so happy that you're able to join us today.

We'll be sure to link if you have social media, if you have a website, we'll be sure to link that to our additional notes and resources, that way our listeners can find you directly and contact you if they have any questions. But I'm so happy you're able to come and talk to us. I'm really glad Cameron was here. Not that I don't like Jamie being my co-host, but I feel like this was just the perfect podcast episode for Cameron to help me co-host because Cameron, you have your CURE course, and so it's nice to be able to tie everything together. But thank you so much, Dr. Ozturk, for joining us today. We're really happy you're able to do that.

Dr. Ferhat Ozturk

Thank you, Amy. Thank you, Cameron, for having me. It's a pleasure.

Dr. Cameron Jack

Thanks, Ferhat. Always a pleasure.

Amy 36:34

So, Cameron, this is the first time you and I have done an outro together for an episode. But again, I'm glad that you're my person because you have a CURE class here at the University of Florida. I really thought that the medicinal properties idea was really cool. I thought that Ferhat including and incorporating his students into collecting different honeys, but essentially what they're doing is kind of the same project and just seeing what happens through that year. I can't help to think some of the challenges that happen with leading a CURE class. So, I know for you,

you've had a couple of challenges. Are you open to sharing some of the challenges that you've had when managing maybe undergraduate students or trying to do a research project?

Dr. Cameron Jack

Yeah, sure. Those are the kind of things that were like running through my mind when I was listening to Ferhat talk about the way he structures our class because we structure it a little bit differently where he has a bunch of independent researchers asking/coming up with their own questions and asking them. We've got 30 students in a class that are all working under one project. I might break them up into small groups of 5 students. So, some are taking one aspect of the student. You're in charge of looking for these colonies for Varroa, you're in charge of doing all the Nosema counts, this group is in charge of measuring the number of bees and brood, so we're measuring different parts of it. But the way he does it, I mean, he really, really has to be involved in meetings and, and figuring out what each student needs to be successful, which is really intense. But also, I mean, what a cool opportunity for students. In this type of a class, you're going to run into issues. Science never works the way that you think it's going to work, right? Like, there's always something that's going to go wrong. Somebody's going to accidentally drop something. It'll be like a day of something important that happens, but somebody's grandma dies and so they have to leave, right? Anyway, there's just something. Life happens.

It becomes really difficult to do it, which is what I've mentioned before, which is why a lot of faculty don't teach these types of classes because you have to wear so many hats, and it really is exhausting. At the end of the last CURE class I taught, I sat down, I was like, man, I don't know if I'm going to do this anymore. But I will do it again. I'm just going to need other faculty or get some of my graduate students or postdocs involved that can help shoulder a lot of the load.

Amy

Definitely. Can you remind me, what does CURE stand for again?

Dr. Cameron Jack

Yeah, it's course-based undergraduate research experience. So yeah, it's CURE. The idea is that you are giving students real research opportunities, not just canned outcomes that they have to reproduce, right?

Amy

Yeah, absolutely. Well, I'm excited to incorporate instruction into some of the podcast and kind of expose our listeners to the teaching aspect, the instruction aspect, the student aspect of it. I'd love to hear from our listeners, what are your thoughts on this CURE class? What are some really fun honey bee ideas that could be done within a semester with students to introduce them to research? So, don't forget to send us a message on social media or e-mail or any other way.

We'd love to hear your thoughts and maybe we all can convince Cameron to incorporate one of your projects with the students in the future.

Dr. Cameron Jack

Absolutely. Well, actually, a lot of our projects are beekeeper ideas. So, absolutely. I'd love to hear some of those ideas. Thanks for letting me sit in, Amy. I'm sorry, I'm no Jamie Ellis. I don't have that cool southern accent.

Amy

You are *the* Cameron Jack.

Dr. Cameron Jack

That's right, no accent but still passionate about teaching so it's good.

Amy

Thank you for being here with us today, Cameron.

Dr. Cameron Jack

Thanks.

Stump the Chump 40:30

It's everybody's favorite game show, Stump the Chump.

Amy

Alrighty. Welcome back to the question and answer segment, Jamie, This first question is about wax moths. This individual is in Southern Ontario. They're in Canada. They seem to have a lot of wax moths this year. They're wondering if the population kind of goes naturally through ups and downs or what is the reason why beekeepers may see really bad wax moth larvae and damage in one year and maybe not so much in other years. And just to clarify that the wax moth is mainly in the bottom board of the strong colonies where screen bottom boards are used, so that may affect your answer. I'm not sure, but what are your thoughts on this? Just the biology and about wax moths and how they can be an issue for beekeepers.

Jamie

Yeah, I like this question because the beekeeper is clearly paying attention to patterns that they are seeing. So basically, by just listening to that question, they believe they saw fewer wax moths last year, but now they're seeing more this year. Is there some sort of seasonality or cyclical nature to wax moth populations? So, I'm not aware of any overall like five-year cycle, 10-year

cycle, 20-year cycles of wax moths. My experience is that their populations tend to be very locally dependent on the colony nature. And what do I mean by that?

So, let's just say that I have lost a colony or two to Varroa in my apiary and wax moths come in and just take out those combs. So, for the next month, I might see a higher, greater population of wax moth adults showing up in my other colonies in the apiary. And that's not necessarily because they're at a 5-year high or a 10-year high. It's just that I lost a couple that they took advantage of. And it doesn't even have to be colonies in your apiary. It could be colonies in a nearby beekeeper's apiary, or maybe a feral colony that died over winter. So, I would argue, in this particular case, the individual is probably just seeing a one off. In other words, just one of those, hey, I've got a bumper crop of wax moths. I don't think it's a cyclical issue. I think it probably has more to do with the vulnerability of colonies that are already in the area, even if it's not his or her own colonies. It's probably colonies of nearby beekeepers or feral colonies. But wax moths are absolutely everywhere. They just need a reason to thrive. I would say it's just coincidence that maybe you're seeing more this year in southern Ontario, that it would probably change. Maybe even later in the season, but certainly by next year you may get an entirely different response of wax moths.

Amy

Yeah. It's always good to kind of take note of that and see what happens next year, right?

Jamie

Absolutely.

Amy

Okay, so the second question that we have, we've discussed this a bit and I'm not sure if we've discussed it a lot on the podcast or if this is just a topic of conversation that gets brought up like every time we go to bee meetings, whether they're national or whether they're local. But the question is, and let's talk about it because I think we're going to hear a lot more about it in the future, what is going on with research on probiotics on bees? Is there research going on? And if so, you know what are we really looking at as far as what probiotics can do for bees?

Jamie

I think this is a very important and timely question in the honey bee world. So, how do I answer it as diplomatically as I possibly can?

Amy

Are you stumped?

Jamie

No, I'm not stumped. I've got plenty to talk about here. I just want to make sure I go about it well. All right. So, oftentimes, in the honey bee world, the creation of new products and new things to use in beekeeping outpaces the science to keep up with it. So, for example, probiotics have exploded in the honey bee world here in the US, probably in other places around the world. Different feed additives have exploded here in the US and other places around the world. And commercial beekeepers, hobbyists, sideliner beekeepers, they just, maybe I'm over generalizing here, but they just have raced to use these things and put them in colonies. And then we'll start hearing about the benefits of this and benefits of that. Well, after all of these things are happening, the research then starts to try to catch up. So, there is in fact research on probiotics starting to be published now.

I need to give you a quick caveat here. A lot of the producers of these probiotics tout research that they have maybe independent research that they've conducted with universities, etcetera. But in general, the research, the independent research that's happening now at universities around the world, certainly in the US, and even in our lab, as you know Amy, we're doing research on this very topic, it's starting to catch up. So, there is research starting to happen on probiotics that's being published in peer-reviewed journals. And I would argue, and this is again in danger of being an overgeneralization, in general, it's not currently overwhelmingly positive. So, I'm aware of a few studies in my mind, as an example, where various probiotics, and I'll add to that, even feed additives have been looked at in kind of the context that beekeepers use. And oftentimes, the research is not finding the same results that you'll hear beekeepers mention or maybe some of the companies mention. So, I would say that this is a growing science right now that's trying to catch up with the use patterns of beekeepers.

I'll go back to our lab as an example. There are a few probiotics that we are testing. We've been testing for over a year. We're looking at lab-based studies, we're looking at field-based studies. We're looking at a number of parameters and we are trying to answer some of the questions surrounding probiotics right now. But I hesitate to say that we have enough information to make truly informed management decisions. I'm not telling people to go do it and I'm not telling people to stop using them. I'm just telling people that we're gaining a lot of information at the moment.

If I had to overgeneralize, which I feel like I've said now a few times, I would say that the results are not overwhelmingly positive to me. I would expect something that we purchase under the guise that it's going to be put into colonies, and they're going to just grow and fight these diseases and pests, I'm just not seeing the data match those types of kind of anecdotal reports. But it's early. There are new formulations of probiotics happening all the time. I can expand this to feed additives. The same thing there. So, the future is potentially promising, but I would say right now, there's just, I don't know. The research is happening, but I've not seen data sets that overwhelm me yet.

Amy

Yeah, that's fair. As you were answering that question, I took a look back at some of our past episodes, and I know that in episode 185 with Kirk Anderson, we did talk to him a little bit about some of the work that he did with the non-native probiotics, right? That was probably where my mind was fresh, where I was thinking like, man, we've been talking about probiotics so often and everywhere lately. But for listeners out there, if you're wanting to know the background of probiotics and why beekeepers are looking into that, take a look and go back to episode 185 to hear more about that.

All right, so for the third question that we have. So, this individual is asking about swarm urges and whether or not a colony decides to swarm based on the resources, based on the nectar flow that's available. So, this individual is going to give an example of being in a canola field. So, let's say you've got bees in canola. The bees are bringing it in. They're deciding that they're ready to swarm, they're super happy and they're ready to go. Well, all of a sudden, a couple of days into that process, canola is finished. They're not really giving anything else to the bees. At that point, do bees decide that they're not going to swarm, or do you think they're still going to swarm? Maybe change their mind? What are your thoughts on this?

Jamie

Yeah. It really all depends on how far in the swarm preparation process they are. There's so much in this question. It's really hard to answer a question like this because you tend to overgeneralize about biology. So, this is a very biological urge. In some of the cases that this questioner is asking, the bees would continue to swarm. They'd just continue even if the flow stops. In some cases, the bees would stop because the flow stopped. So, there's not one good answer to give you, but I would just say maybe the best answer is it all depends on how far into the swarming process they are. If the queen has lost weight, if she's reduced her egg output, if they've got capped queen cells, it's almost certainly going to happen at that point. But if the bees are very early in the swarm preparation process, then I would argue that the cessation of a significant honey flow would cause them to stop. So, it really again depends on how far into the process they are. Even then, that's a bit fuzzy because biology's messy and swarming is the strongest urge that colonies have, so once they get too far down that road, it really doesn't matter at that point.

Plus, there's plenty of colonies that swarm outside the nectar flow because they missed the environmental cues all together and they just, quote, want to swarm. So, even though those are very likely to be doomed in the environment because there's no resources available for them, it illustrates how important that swarm urge is to them. So, I would say it's not quite as cut and dry as you have honey flow today, you have no honey flow tomorrow. The bees pick up on that quickly and stop everything. It's like, nope, nope. We've changed our mind. Just don't think it's that simple.

Amy

Yeah, I think that's fair. I'm still waiting for someone to send you a T-shirt that says biology is messy with our podcast logo on it.

Jamie

Yeah, you know, funny you say that. I also answer questions, as you know, from the American Bee Journal. So, people will often e-mail me, "I'm going to ask you a biology question, and I know it's messy, but here's my question." You know, another thing that they hear us say all the time, too, Amy, is follow the label. I'm going to keep this anonymous, but I was speaking to a local bee club last week and I was having dinner beforehand with some of the beekeepers and someone who was at the table, again, it will be anonymous because they're an avid listener, I just want to give an anonymous shout out to them. They looked at me and said, "Jamie." I said, "Yeah?" They're like, "In your segment, Stump the Chump. Do you ever get stumped? You just know everything." I said, "Well, what you don't know is that we get a lot of questions, and I do the research on the questions before I come on here and answer or we just don't ask the question."

Amy

Yeah, right.

Jamie

It's very much a facade. I look intelligent, but it's because we do so much work behind the scenes to figure out the answers.

Amy

That's so funny.

Jamie

So yeah, there's a lot, a lot associated with this from "biology is messy" to "follow the label" to Stump the Chump. So yeah, we've got a lot of secrets, I guess.

Amy

Yeah, you've just told our biggest secret, like, oh yeah, you know all the answers. It's like, well, the questions we don't know answers to, we just don't ask on air.

Jamie

Or I have to spend time looking up those answers, and then they make it to a future episode. I'm looking right now at the next few weeks questions that we're going to have to answer and those are going to be ones I have to look up papers for. So, it is technically called Stump the Chump, but we do bias it a little bit to where I don't look like a chump every week maybe.

Amy

That's hilarious. All right, well, thank you all for listening and thank you for your questions. We can't do the Q&A without the questions that you all send to us. So don't forget to send us questions on our social media page, send us an e-mail. We love to hear what your questions are. The likelihood of someone else having the same question as you is probably high. So, we appreciate your feedback, and I hope you enjoyed this episode.

Thanks for listening to today's episode. This episode was edited and produced by our podcast coordinator, Mitra Hamzavi. Thanks, Mitra.

Jamie

Visit the UF/IFAS Honey Bee Research and Extension Laboratory's website, UFhoneybee.com, for additional information and resources for today's episode. Email any questions that you want answered on air to honeybee@ifas.ufl.edu. You can also submit questions to us on X, Instagram, or Facebook @UFhoneybeelab. Don't forget to follow us while you're visiting our social media sites. Thank you for listening to Two Bees in a Podcast.